

Claims

1. A mechanical press apparatus provided with a drive portion which moves upward and downward an outer slide and an inner slide arranged in an inner side of the outer slide at a predetermined timing, characterized in that the mechanical press apparatus comprises:

an elevating plate fixed to a lower end surface of said outer slide so as to oppose to a lower surface of said inner slide;

an upper die (an upper mold) fixed to a lower surface of said elevating plate;

a lower die (a lower mold) positioned at a lower surface of an upward and downward movement of said upper die so as to press;

a first hydraulic cylinder provided in an upper surface portion of said elevating plate and contracted by a pressing force at a time when said inner slide moves downward; and

a second hydraulic cylinder interposed between said outer slide and said drive portion and expanded working with a pressure of a pressurized fluid supplied from said first hydraulic cylinder at a time when said first hydraulic cylinder is contracted by the pressing force of said inner slide, thereby pressing said outer slide to a lower side.

2. A mechanical press apparatus as claimed in claim 1, characterized in that each of said first hydraulic cylinder and said second hydraulic cylinder is of a single rod type

having an expansion rod integrally provided with a piston portion which is reciprocated in a longitudinal direction in an inner portion of a hollow and sealed cylinder barrel so as to expand and compress a fluid in an inner portion, and a rod portion which is extended from the piston portion to an outer portion of said cylinder barrel, and of a double action type having a primary port supplying and discharging the expanded and compressed fluid to a side of the piston portion of said expansion rod and a secondary port supplying and discharging the fluid in a side of the rod portion of said expansion rod in said cylinder barrel, and the cylinder barrels of the first hydraulic cylinder and the second hydraulic cylinder are connected in said primary ports to each other via a consecutive passage, and work with each other such that the pressurized fluid flows into said second hydraulic cylinder via said consecutive passage at a time when said first hydraulic cylinder is contracted, thereby expanding said expansion rod.

3. A mechanical press apparatus as claimed in claim 1 or 2, characterized in that a rate $A1/A2$ between a pressure receiving area $A1$ of said first hydraulic cylinder (the piston portion) and a pressure receiving area $A2$ of said second hydraulic cylinder (the piston portion) is set to be equal to a rate $P1/P2$ between a pressing capacity $P1$ of said inner slide and a pressing capacity $P2$ of said outer slide.

4. A mechanical press apparatus as claimed in any one of claims 1 to 3, characterized in that a first pipe line for

supplying the pressurized fluid having a predetermined pressure from a pressure source is connected to an area of said consecutive passage connecting the primary ports of said first hydraulic cylinder and said second hydraulic cylinder to each other, a second pipe line for supplying the pressurized fluid having a higher pressure than that of the pressurized fluid supplied to said first pipe line from said pressure source so as to return to said state before being communicated is connected to the secondary port of said second hydraulic cylinder, and the secondary port of said first hydraulic cylinder is provided so as to supply and discharge an air serving as the fluid in correspondence to said motion thereof.

5. A mechanical press apparatus as claimed in any one of claims 1 to 4, characterized in that said first hydraulic cylinder is provided so as to be actuated only by said primary port with canceling said secondary port.

6. A mechanical press apparatus as claimed in claim 2 or 4, characterized in that an accumulator (a pressure accumulator) is provided in the secondary port of said second hydraulic cylinder.

7. A mechanical press apparatus as claimed in claim 1, characterized in that a die set portion for coupling said upper die is provided in the lower surface of said elevating plate.

8. A mechanical press apparatus as claimed in claim 4, characterized in that a check valve for preventing the

pressurized fluid from flowing backward with respect to said pressure source, and a pressure control valve arranged in a downward side of said check valve are respectively interposed in said first pipe line and the second pipe line, and a working pressure of the pressure control valve in said first pipe line is set higher than that of the pressure control valve in said second pipe line.